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METAL WORK AND ETCHING

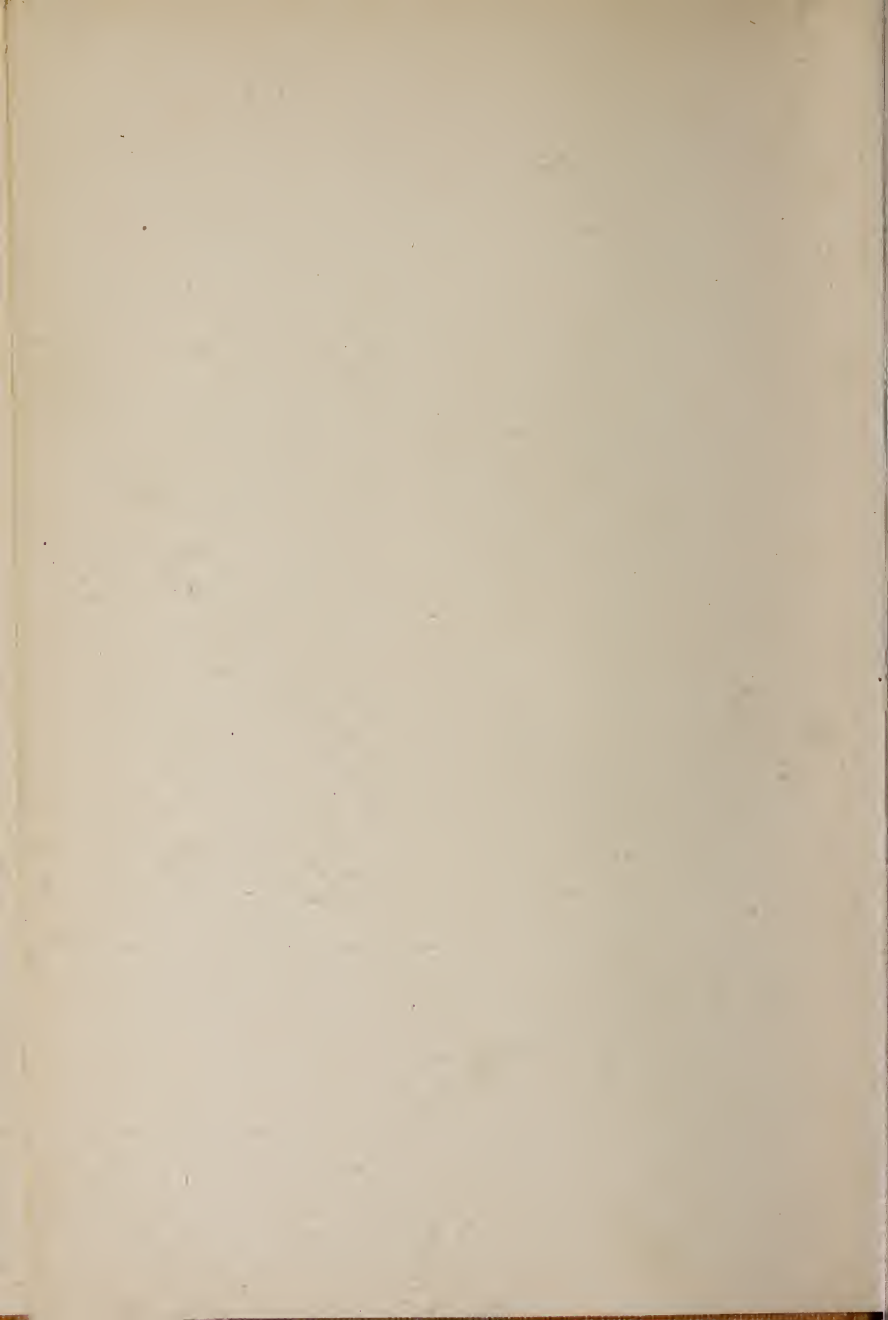


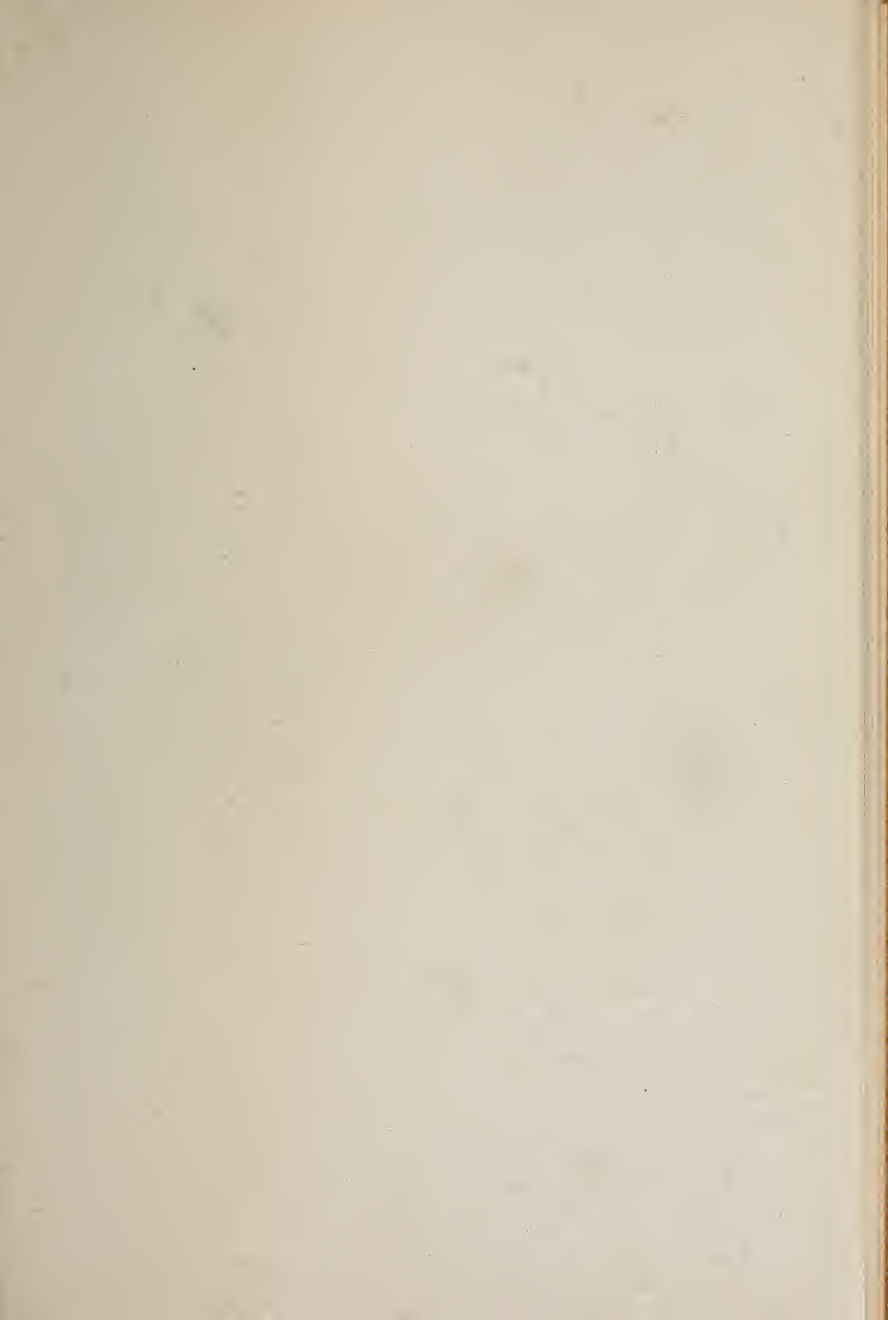
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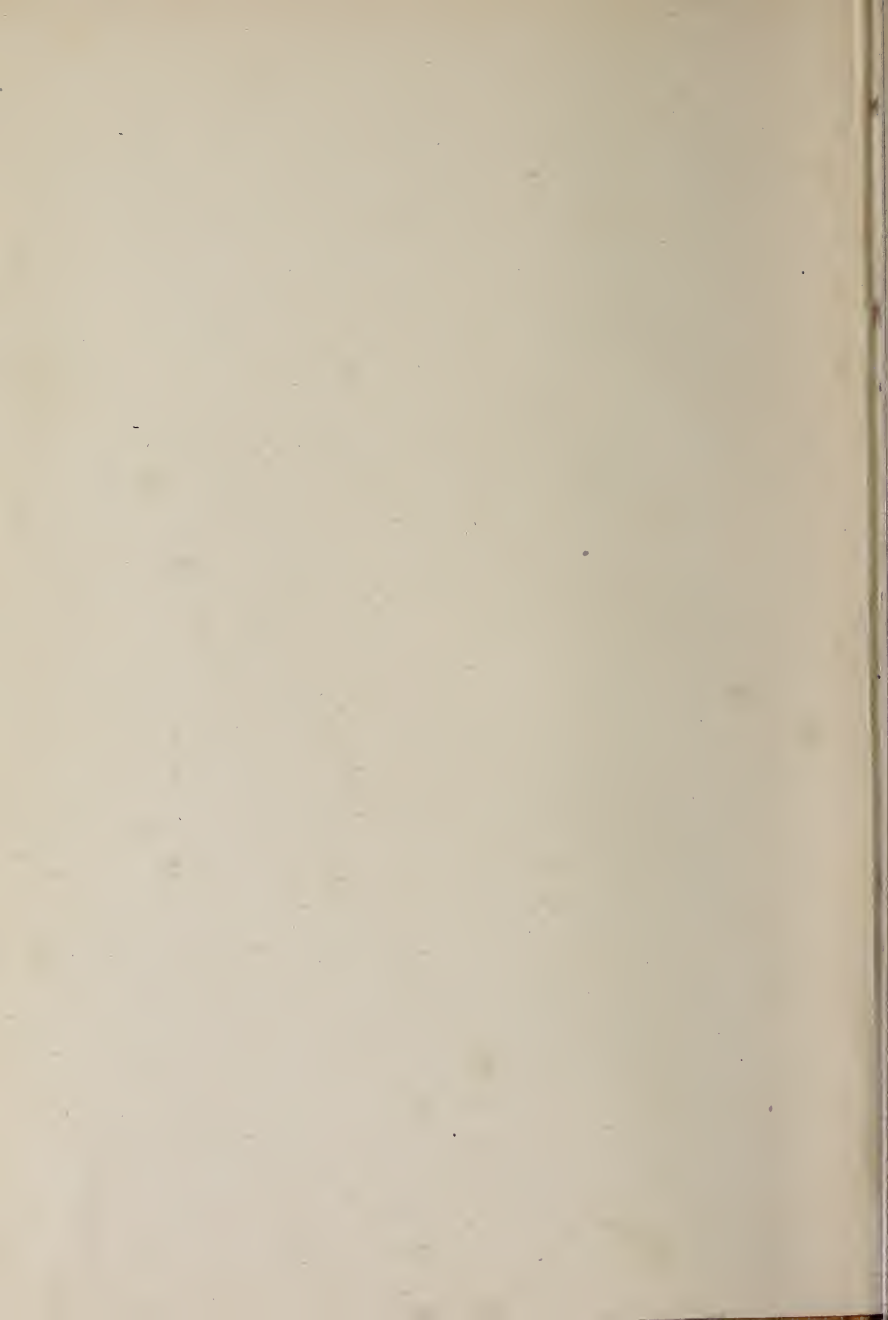
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Why ask for the moon
When we have the stars?







METAL WORK AND ETCHING

BY
JOHN D. ADAMS



WITH ADDITIONAL DESIGNS

BY
OTHER WRITERS

POPULAR MECHANICS HANDBOOKS

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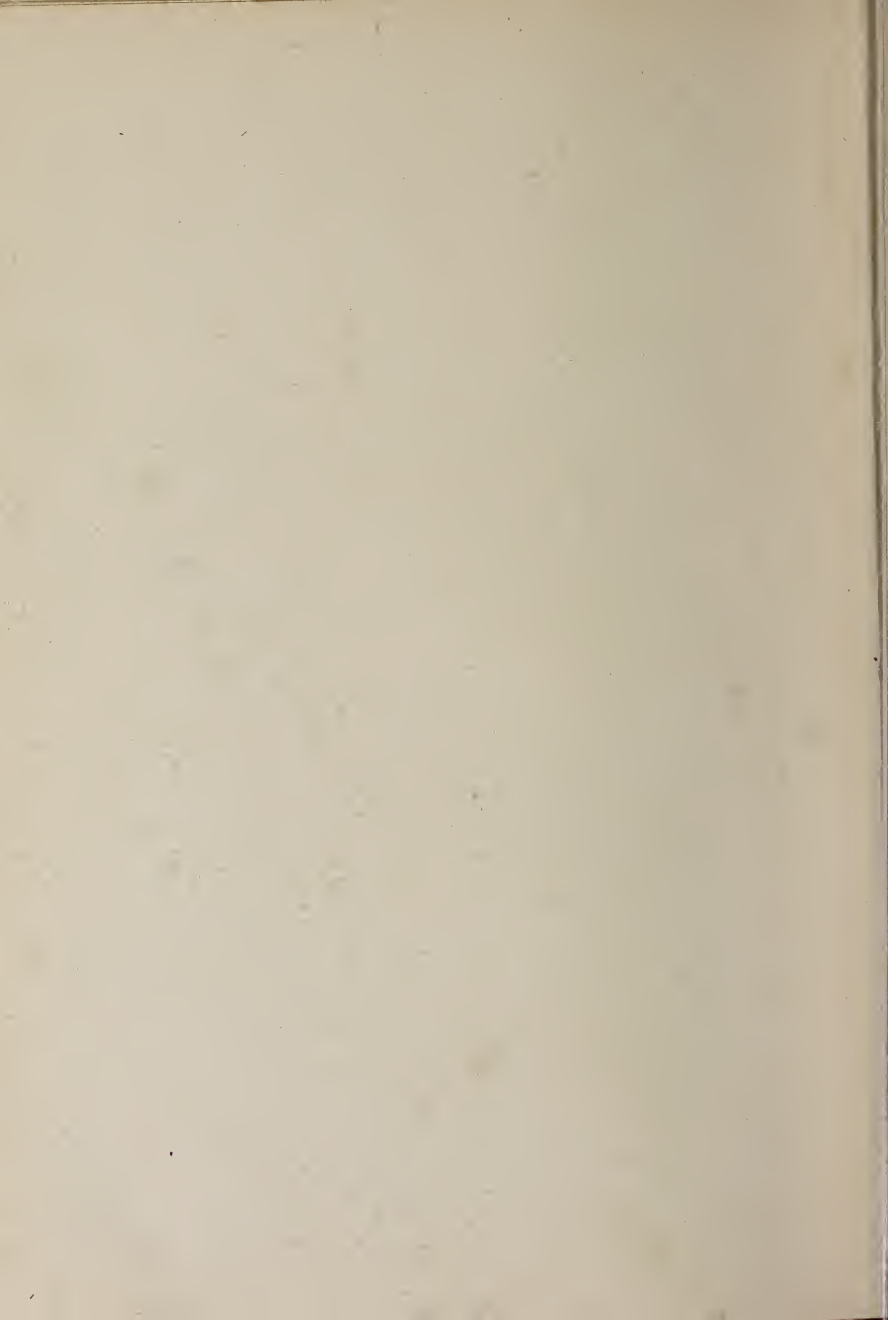
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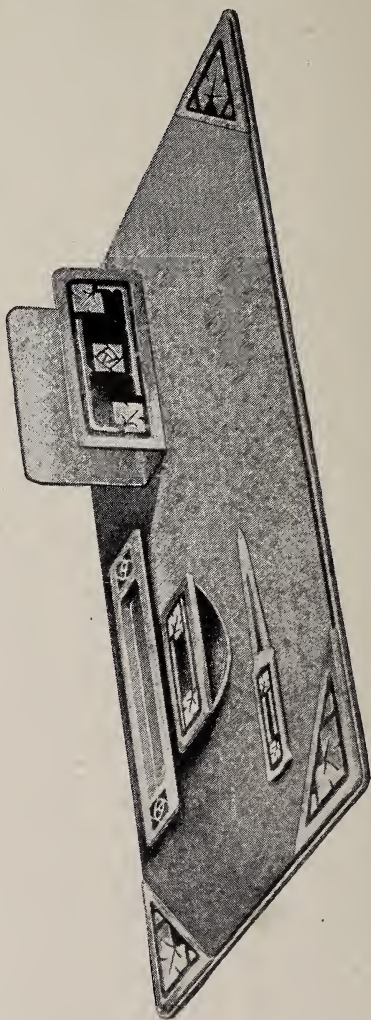
THIS book is one of the series of handbooks on industrial subjects being published by the Popular Mechanics Company. Like the Magazine, these books are "written so you can understand it," and are intended to furnish information on mechanical subjects at a price within the reach of all.

The texts and illustrations have been prepared expressly for this Handbook Series, by experts; are up-to-date, and have been revised by the editor of Popular Mechanics.



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Desk Set Made of Either Brass or Copper
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METAL WORK AND ETCHING

INTRODUCTION

IT is the intent of this and several succeeding articles to point out a few of the many artistic possibilities of brass etching that render this gentle art one of the most fascinating and least expensive of hobbies. It is fascinating because the field is almost without limit. Book ends, on which is etched an attractive design or favorite quotation; desk sets, comprising the blotter corners, stationery rack, calendar and paper knife, all etched with the same motif; arts-and-crafts jewelry, such as hatpins and watch fobs; pipe and tie racks and match holders, not to mention the many plain hammered brass and copper pieces that may be purchased and etched in all manner of pretty designs, are among the many practical and attractive possibilities.

This art is fascinating because it affords the worker every opportunity for the display of original talent in working out of new designs, and those to be illustrated in this series have been selected not so much on account of any particular artistic merit, but because they are suitable for the amateur and serve to clearly set forth the method involved. And unless we may hope to so instruct the reader that he or she will be able to apply these methods to the carrying out of new ideas and designs, our efforts, we feel, will have been in

vain. For a great many, there is undoubtedly much pleasure in working with the hands; but, when the thing made is the product of one's own originality, this pleasure is doubled.

Not only is our subject truly interesting, but the work inexpensive to carry on and does not require much space. Any convenient nook or corner where may be kept a few jars or trays of glass or crockery, a bottle of nitric acid, a small can of asphaltum paint and two or three brushes, is about all that is necessary in the way of a workshop to initiate the beginner. As the work proceeds, the results will become more perfect and therefore more interesting, so that the reader will not hesitate to invest in such few tools as the constantly increasing scope of the work may make necessary. Remember, however, that the fascination of any of the crafts lies largely in the doing of original work, so that it is better to have made some simple thing of an original design than to make a mere copy of something more elaborate. If one is on the lookout, a suggestion for a design is apt to turn up almost any place; and among the advertisements of the current magazines or in labels and fancy wrappers, one may find an idea that will serve as the starting point for several original designs.

It is to be hoped that no one will imagine that this series has anything in common with that department-store, brass-covered woodenware upon which the design or pattern is already clearly stamped, thus leaving nothing more to be done except the punching of this pattern full of holes. That fixed operation permits of no originality, requires no talent, very little time and a like amount of intelligence.

BOOK ENDS

LET us suppose that the following supplies have been purchased: About a half-pound bottle of nitric acid; a like amount of turpentine or kerosene; a few cents' worth of black asphaltum paint or varnish; a small and a large water-color brush; ten cents' worth of lacquer; a sheet of carbon paper, and a piece of 16 or 18-gauge brass, measuring 6 by $7\frac{1}{4}$ in.

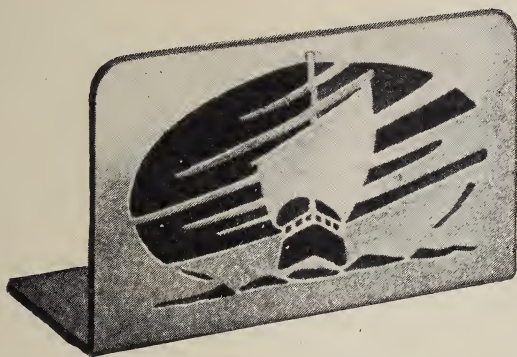


Fig. 1—Effective Book-End Design

A flat file and a pair of tin snips will be required sooner or later and may as well be purchased at once.

Square up the sheet of brass to the proper dimensions, and then round off the corners rather liberally. About three of the seven inches must now be bent to a right angle to form the base portion. This operation should be done over the sharp edge of a table or between two pieces of wood held in the vise, so that the

bend may be uniform along its entire length. Upon a sheet of paper make a full-size and accurate drawing of the design to be etched, and, after thoroughly cleaning the surface of the brass, transfer the design thereto by means of the carbon transfer paper, taking due care to keep the surface clean and free from grease. Now take the small brush and see that the asphaltum paint is of such a consistency as may be readily and accurately applied. If too thick, thin with turpentine, and then paint out all that portion of the design that is not to be etched. The larger brush will now be useful in expediting the application of the paint to the remaining portion of the face and to the entire back. That is, nothing but the darker portions shown in the illustrations should be left uncovered. After the paint has thoroughly dried, which may take from eight to twelve hours, the piece should be immersed in a solution composed of one part nitric acid to two parts water. In making this solution, be sure to pour in the acid last, or painful burns and damage to clothing may result. In the present instance, a glass tray, such as photographers use, will be found convenient. If after five or ten minutes the solution should bubble rather actively and throw off heavy greenish-yellow fumes, a little water should be added. The duration of the etching process will vary from one to four hours, depending on the strength of the solution and the composition of the metal. Until a little experience has been gained, it will be well to lift the brass from the solution every now and then to see how the etching is progressing. As soon as the required depth has been obtained, remove the piece, rinse it off, and then remove the asphaltum by means of a rag after a good soaking in kerosene. Finally wash with soap and water, and dry. In order that the design may show up, the contrast between

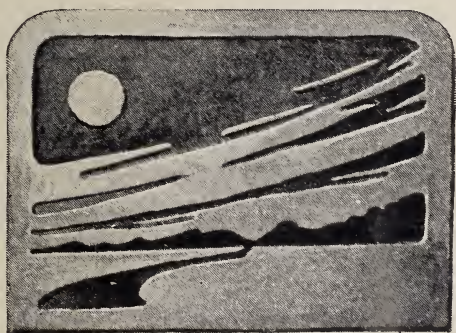


Fig. 2A—Designs for Book Ends

the etched and unetched portions must be developed by means of some oxidizing agent such as a strong solution of butter of antimony, which soon darkens the clean surface of the metal. The high lights are then rubbed up with pumice or a piece of old emery cloth, after which a uniform coat of lacquer should be put on, so as to render the effect permanent.

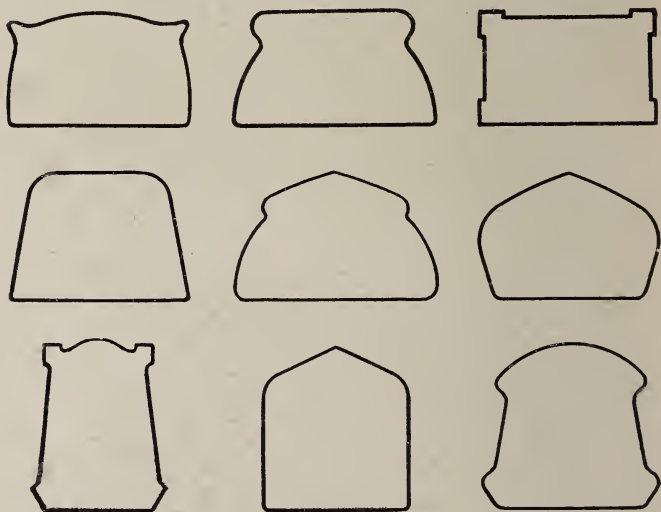


Fig. 3—Outline Suggestions for Book Ends

Four additional designs for book ends are illustrated, and the line drawing (Fig. 3) gives a few suggestions in the way of different outlines. Referring to the former, the design shown in Fig. 2 B, at the bottom, requires considerable hammer work, as the outer edge is bent over and hammered down all the way around the top and sides, and the center portion is beaten out.

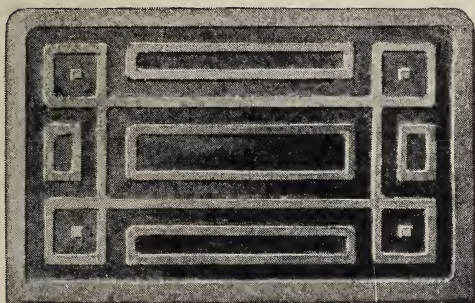


Fig. 2B—Conventional Designs for Book Ends

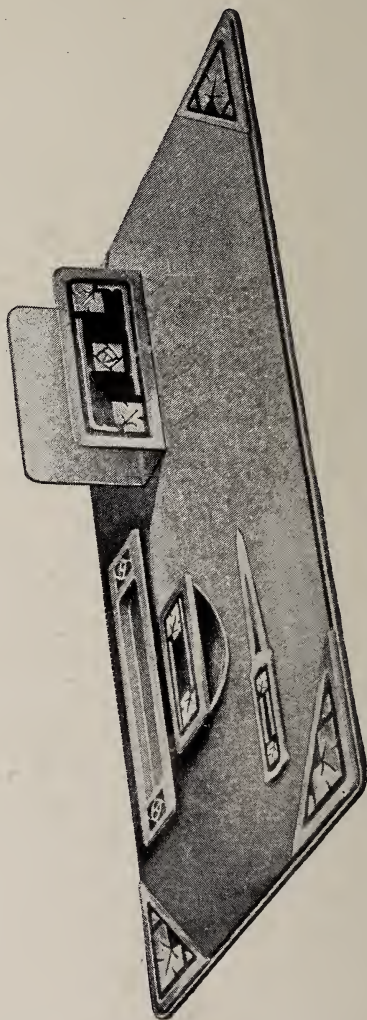


Fig. 4—Desk Set Made of Either Brass or Copper

DESK SETS

ONE of the most interesting tasks in connection with amateur metal work is that of making a desk set, comprising the four corners for the desk pad, a paper knife, a rocking blotter, a calendar, and such other articles as may be desired. The same general idea should, of course, characterize the designs or patterns etched on the various pieces of the set, and may often be worked out on pieces that have been purchased. For instance, a simple little oblong brass tray may be appropriately etched and when placed among the other pieces on the desk looks, for all the world, as though it had been there from the first.

These sets may be made from either brass or copper, the latter costing about 25 per cent more than the former, which, however, is a small consideration, as the entire cost of the required amount of either is quite small. If brass is used, the coloring may be done by butter of antimony as previously described in the case of the book end; but for copper, a solution made by dissolving about a teaspoonful of potassium sulphide in four ounces of water should be used. Polish up a scrap of the metal and then test the solution thus made before using it on something important.

The following pieces will be described in the order stated:

Corners for Blotting Pad
Paper Knives
Stationery Racks
Rocking Blotters
Calendars.

BLOTTING-PAD CORNERS

THE size of the corners for the desk pad vary from three to four inches on a side, according to the dimensions of the pad or on account of the design to be etched on them. These can be most conveniently and economically worked up in pairs. The reason for this will be evident upon an inspection of the line drawing (Fig. 6), which gives the size and shape of the metal necessary to make one pair. After the etching, the bending will be done along the dotted lines, and the square cut in two diagonally. Lay out the pattern to be etched full size, and after cleaning the surface to be etched with mineral wool or old emery cloth, transfer it thereto by means of the carbon transfer paper. Keep the surface free from grease. Paint out the portions that are not to be etched with the asphaltum paint, and allow it to dry over night. In passing, it may be stated

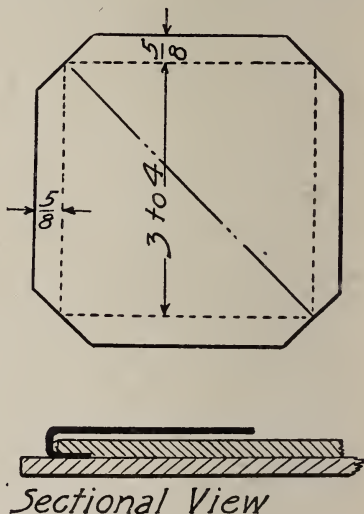


Fig. 6—Cutting a "Pair" of Corners

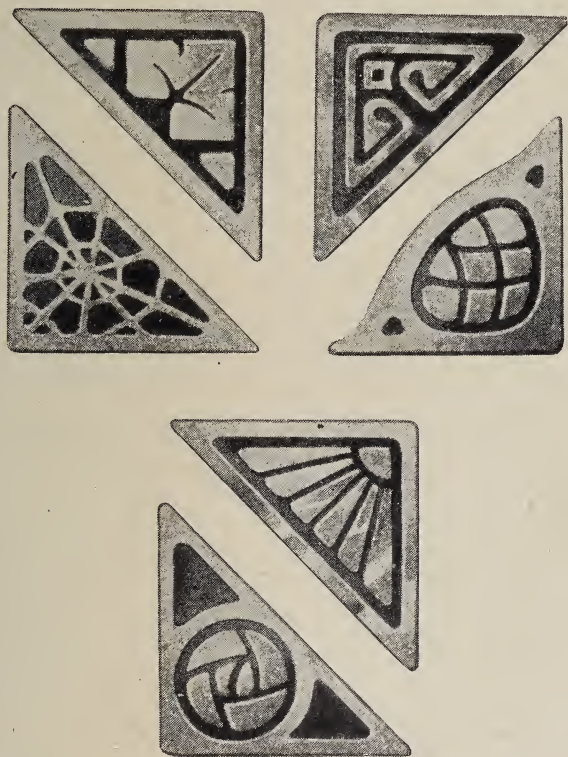


Fig. 5—Designs for Blotting-Pad Corners

that some workers prefer beeswax to the asphaltum, as it permits the etching process to proceed without any intermission for drying. This material, however, must be kept warm while being used and the painting carried on rapidly, as the wax sets almost instantly.

When the asphaltum is dry, proceed with the etching, and gauge the strength of the solution of nitric acid to such a point that only moderate bubbles will arise after five or ten minutes' immersion. Soak the piece in kerosene when sufficient depth has been etched and then remove the asphaltum with a rag, finally cleaning with soap and water. The square should now be cut diagonally and the two triangles hammered perfectly flat preparatory to bending the edges. For bending and forming sheet metal, the professional metal worker has what is called a "bench plate" which is merely a socket into which may be fitted vertical irons called "stakes," these being variously shaped on their upper ends according to the duty they are to perform. In the present instance the smoothing stake, having a flat surface on top, would be selected, and, while the major portion of the triangle is firmly held down, the overhanging edge would be bent over with a mallet. An ordinary flatiron, however, answers every purpose, provided it is securely held with the face up. Where an ordinary carpenter's vise is at hand, excellent bending may be done by clamping the work between hardwood strips. If the metal is not real soft, so that it bends easily, heat it over a gas flame and then plunge into cold water. When the edges have been bent clear over, there should remain a space of about three-sixteenths of an inch, depending upon the thickness of the upper layer of the blotting pad. The corners may now be thoroughly cleaned with mineral wool, or pumice and lye water, after

which the coloring solution previously described should be applied. Rub up the high lights and when the desired effect has been produced, flow on a uniform coat of lacquer—and our corners are complete.

If the reader desires to make the blotting pad also, inspect some on exhibition at the stationery store so as to get all possible pointers. The pad, usually about 14 by 22 in., should be in two layers or sections, so that the upper one may be raised at the corners and the bent-over edges of the metal corners inserted, after which the whole may be made secure again with glue. The sectional view clearly shows this feature.



PAPER KNIVES AND LETTER OPENERS

PAPER knives and letter openers may be made in lengths varying from 5 to 10 in. Where the opening of letters is the principal duty, a rather short implement will answer every purpose, but where the uncut leaves of books and magazines are to be dealt with, a longer knife is desirable.

The simplest type to make is illustrated in the fourth one from the top in the set of six, which consists of nothing more than a tapering strip of 16-gauge metal, on both sides of which an appropriate design is etched. The first two knives are made from quite heavy metal, which is filed thinner and slightly rounding for the blade portion. This is not so tedious a process as one might suppose, provided a good sharp file is used. The piece should then be smoothed up with a fine-tooth file and finished with emery cloth. The lower two knives are made from hard wood and have a small etched plate on each side of the handle. The wood should, if possible, be the same as that of the desk top on which it is to be used, and similarly finished. When this has been made ready, prepare the two small plates from No. 20-gauge brass or copper and thoroughly scour them, after which the design should be drawn out on paper and then transferred to the metal, which in the meantime must be kept clean from grease. With the asphaltum, paint out all those parts that are to remain unetched, including the backs; and, when thoroughly dry, immerse in the two-to-one nitric-acid

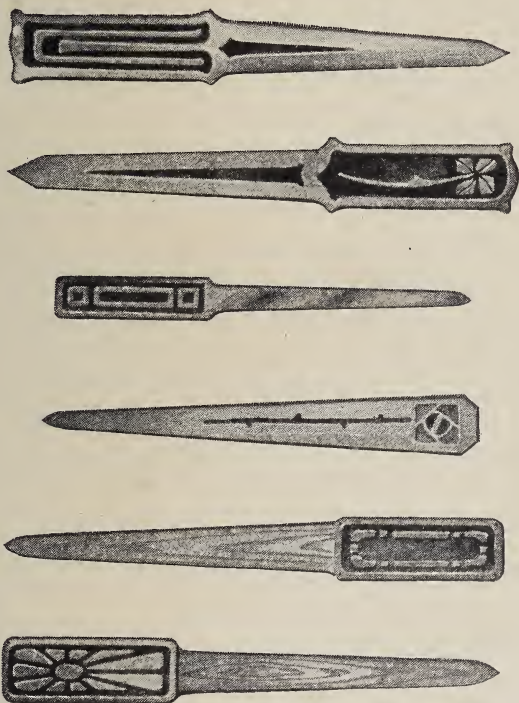


Fig. 7—Designs for Paper Knives and Letter Openers

solution. In the case of the all-metal knives, the paint need not be applied all over, unless the whole is to be dipped.

In coloring copper, many beautiful effects may be obtained after a little experience by simply heating over a gas flame. Iridescent effects, purples and chestnut browns will all show up one after another, and when the desired result has been secured, withdraw the metal from above the flame and set aside to cool. The high lights should then be rubbed up and the result made permanent by a coat of lacquer.



STATIONERY RACK

BESIDES being employed for the purpose indicated by its name, the stationery rack also serves to hold the unanswered letters and other papers that are to be attended to in a few days.

Our illustration shows three ways of constructing this article, and the line drawing gives all necessary dimensions, except the gauge of the metal, which should be No. 18. The left-hand rack is composed of three pieces—front, back and base—all securely riveted together. This type is preferable where only a narrow rack is required, as the separate base provides the necessary stability. In bending the base, take due care to have it of uniform shape along its entire length, and then round off the corners. The front and back should now be squared up, allowing about a half inch for bending over to connect with the base. Do this bending over the sharp edge of a table while the sheet is held down with a block of wood. The design for the front should now be taken into consideration and when decided upon is to be neatly drawn full size upon paper. After thoroughly cleaning the surface of the metal, transfer the design thereto by means of the carbon transfer paper, and then proceed with the painting out of the parts that are to remain unetched, using the asphaltum, thinned to the proper working consistency with turpentine. When dry, immerse in the etching solution (nitric acid one and water two parts) and during the progress

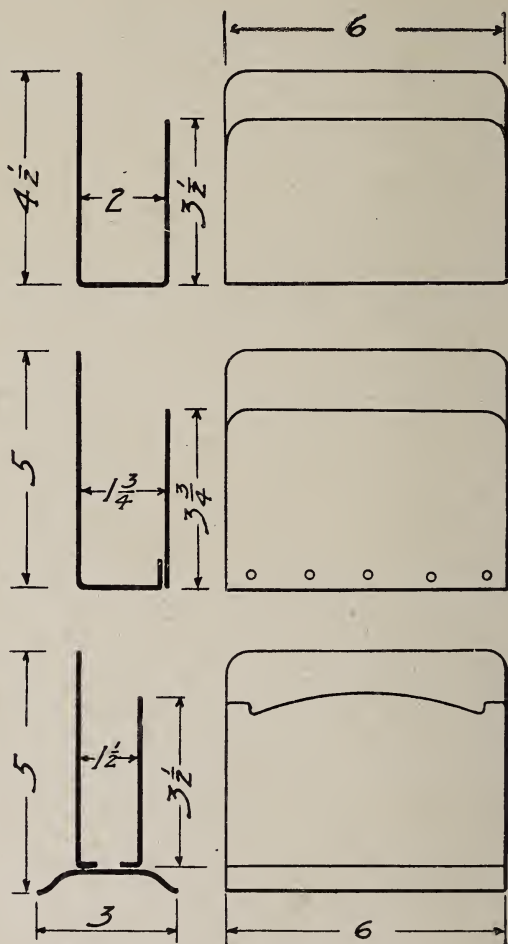


Fig. 9—Details of Stationery-Rack Construction

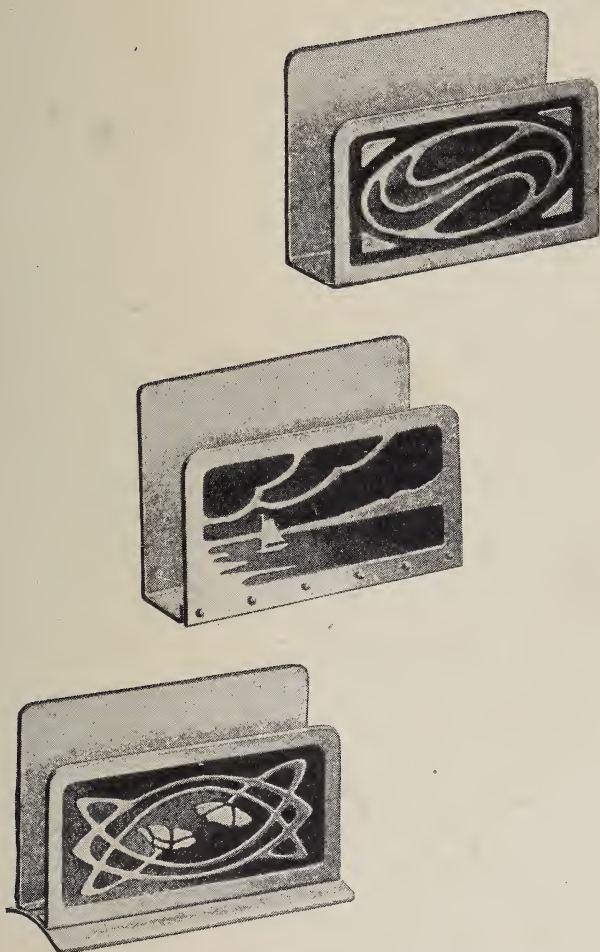


Fig. 8—Three Styles and Designs of Stationery Rack

of the work carefully avoid the inhalation of the fumes, which to some are peculiarly irritating. In the meantime rivet the back and base together. After three or four hours, when the etching will have been completed, remove the paint with kerosene and thoroughly clean the metal. In either brass or copper a very fine verdigris effect may be obtained by an application of the following solution: Dissolve about 50 gr. each of copper nitrate, ammonia chloride and calcium chloride in 3 oz. water. The unetched portions may be rubbed up bright with a little pumice or very fine emery cloth, after which an application of lacquer will preserve the effect indefinitely. In trying a new solution, the reader will, of course, appreciate the advisability of trying it on a small scrap before undertaking to finish such a piece as our rack.

The center design of the illustration is composed of but two pieces; viz., the back, which is bent under to form the bottom, and the front, which is riveted to the forward edge of the bottom. From what has already been said, the reader will have no difficulty in working out this rack. The making of the rivet holes in these racks will necessitate the use of a small hand drill, a tool that may be purchased for less than a dollar and one that will be found very useful in almost any kind of arts-and-crafts work.

The right-hand design is made from one piece of metal. In making the first bend, no difficulty will be encountered, but in the second one, some little care will be necessary in order to have the base perfectly flat. Other than this, the work will proceed as in the two previous racks.

ROCKING BLOTTER

WE now come to a rather interesting feature of our desk set—the rocking blotter, of which we illustrate three variations. The one to the left is the simplest of all, consisting of but two pieces of metal, the top one of which is bent over at each end, so that when the curved portion, covered with blotting paper, is sprung into place it will be securely held. The top in this case should be of No. 16-gauge brass or copper and the bottom of 20-gauge spring brass or bronze. In the right-hand design, the side edges of the top are also bent down, which gives the blotter a more solid appearance and permits of using a lighter gauge. The third design is provided with a knob, which may be of hard wood, ebony preferred, or else in the form of a small metal handle fastened in place with rivets. All dimensions are given in the line drawing, except for the length of the spring bottom, which is $4\frac{1}{2}$ in. The various bends are indicated by the dotted lines.

The most important point in the construction is to secure good sharp bends, which can only be accomplished by having the metal soft, a condition that is easily arrived at by heating the brass or copper over a gas flame and plunging into water. When all bending and filing has been satisfactorily completed and the metal made clean, lay out the desired design on a sheet of paper and then transfer it to the top. Paint out the portions that are not to be etched, using the asphaltum or the regular etching enamel as sold by

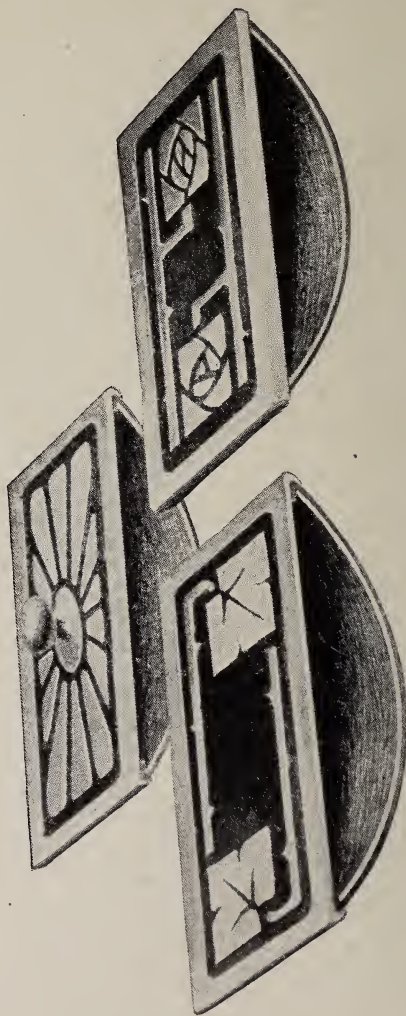


Fig. 10—Three Styles and Designs of Rocking Blotter

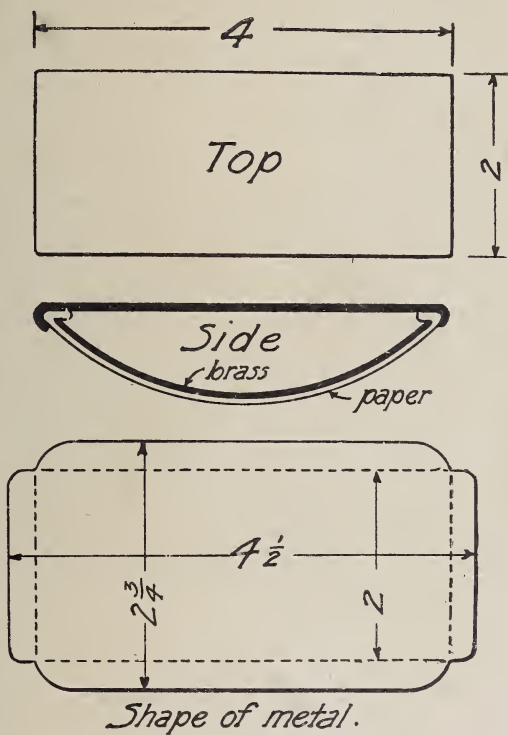


Fig. 11—Dimensions for Rocking Blotter

dealers in manual training supplies, and then proceed with the etching in the two-to-one nitric-acid solution. The etching completed, the paint may be removed by kerosene, after which the metal is to be thoroughly cleaned. The coloring, in the oxidized or verdigris effect as desired, is now to be attended to, and made permanent by coating with lacquer.

Those who do not care to take up the etching may make a very good desk set by adopting the hammered-copper or the brushed-brass effect throughout. The former is produced with the ball end of the "ball-pein" hammer, and is accentuated by coloring and then rubbing the higher portions brighter. The brass effect is simply a matter of uniformly rubbing with emery cloth in the same direction, and is often termed "lemon" brass.

The reader, it is to be hoped, will not mistake our motive in showing so many different patterns and neglect to have each and every piece of his set harmoniously etched. The patterns already shown have been given considerable variety to serve as suggestions, but all the pieces of any one set should have a like motif running through all the designs of the several pieces.



DESK CALENDARS

THE small calendar in the center of our illustration is a very simple affair; a single piece of brass or copper is bent at an angle to form a base, and, after etching some appropriate design on the upper portion, the pad from a small calendar is attached with shellac or varnish. This form of calendar may be made as small and dainty as desired, so we need not give any dimensions.

In the other form of calendar illustrated, we have greater opportunity for artistic treatment. The sheet of metal should be about 6 in. square. Accurately lay out the rectangular opening in the center and then cut it out with a small metal saw similar to those used by jewelers. The purchase of this saw is not absolutely necessary at this time, as the opening may be cut with a cold chisel and finished with the file, or else it may be etched out; but such a saw must be procured before we reach the end of our series. After thoroughly cleaning the metal, transfer the design to it from the piece of paper upon which it has been previously drawn out in pencil. Paint out the not-to-be-etched portions, including the back and base, with the asphaltum paint, and then go on with the etching in the usual manner, using a photographer's developing tray. After some three or four hours, as required, remove, and clean off the paint with kerosene.

In order to hold the leaves or cards of the calendar proper, we must solder onto the back three bent strips

as indicated at A in the working drawing. Bend these up from thin metal, and then thoroughly scour them and the back with emery cloth. This brings us to the feature of soldering, which will prove surprisingly simple if gone about correctly. The art of soft soldering is one that has no end of uses among the various handicrafts and should be among the accomplishments of every amateur. The fluxing solution may be purchased, or made as follows: In a few cents' worth of

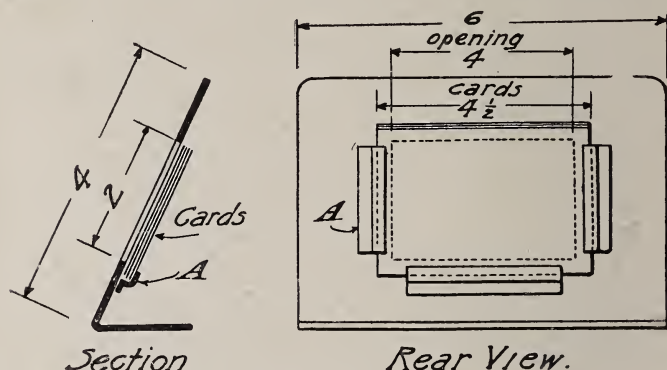


Fig. 13—Detail of Desk Calendar

muriatic acid dissolve as many pieces of scrap zinc as possible and then strain the solution, which may then be used to solder any ordinary metal, except aluminum. Some wire solder having been procured, moisten the two pieces to be joined with the above solution and place a few small pieces of the solder in position. If the metal is thoroughly clean and is now held over (not in) a gas flame, in a few minutes the solder will flow all through the connection. A soldering iron may be used instead of the flame, but the lat-

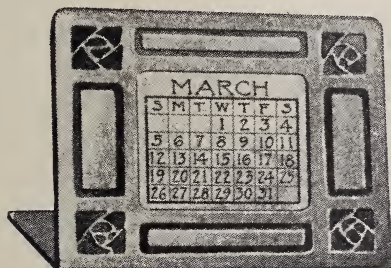
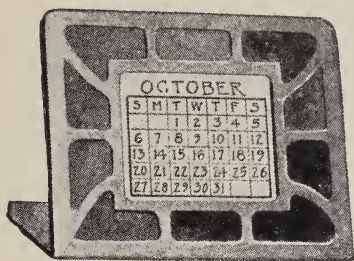


Fig. 12—Designs for Desk Calendar

ter, or else a blowpipe, is the better way. Having secured these three strips to hold the cards, the face should be cleaned up and treated with either the darkening or verdigris solution previously described. The design is now to be accentuated by rubbing up the higher portions; after which a uniform coat of lacquer, or banana oil as it is sometimes called, should be applied to render the effect lasting.



MATCH BOXES

BEFORE going further let us recapitulate what has been said in regard to the various finishes that are possible. The simplest finish for brass or copper is the hammered effect with the higher portions rubbed up bright. Lemon or brushed brass comes next and may be produced by a uniform treatment with emery cloth. With a little experience, beautiful iridescent and chestnut-colored effects may be secured upon copper by merely heating to the proper degree. Very dark effects ranging from brown to black are secured on copper by a solution of potassium sulphide and water: a teaspoonful of the former to four ounces of the latter. On brass, similar effects are produced by a strong solution of butter of antimony. Verdigris effects on both metals are made with the solution previously given; viz., copper nitrate, ammonium chloride and calcium chloride, 50 gr. each in 4 oz. of water. In all these effects the high lights are to be rubbed up bright as desired and the result made permanent by a coat of lacquer.

We now come to the rather practical subject of match boxes, which, as shown by our illustration, may be made quite attractive and in great variety. With the exception of the trough-shaped box, the boxes proper are all of the same size and are made from a single piece of brass or copper of the form shown in the working drawing. After cutting to shape, a little careful bending completes the opera-

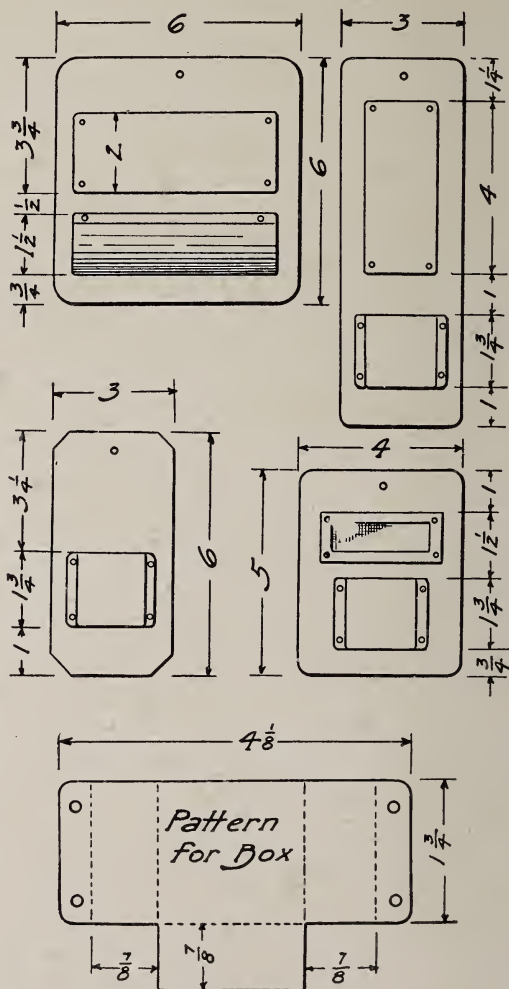


Fig. 15—Details of Match Holders

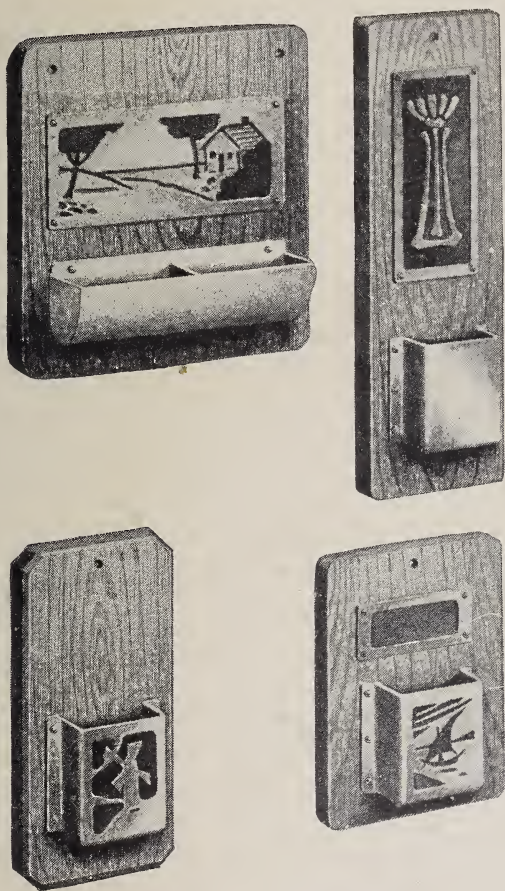


Fig. 14—Designs for Match Boxes

tion. Heat the metal over a gas flame if not sufficiently soft, and then plunge it into water. The box thus formed may be etched with some simple design before fastening to the wood, or else may be left plain and the wood decorated with a separate plate appropriately etched. The various forms illustrated are sufficiently numerous to enable the reader to make an attractive match holder suitable both in size and form to the wall space available. Sometimes two boxes are placed on the same block of wood, one for used and the other for unused matches. A small metal frame, such as is used to hold cards on the front of office drawers, is a serviceable addition, as it accommodates a piece of emery cloth for striking purposes. When worn, the emery may be readily renewed. Such a match holder is shown in the lower right-hand corner of the illustration.

The process of etching will, of course, be carried on as previously described.



TIE AND PIPE RACKS

IN tie and pipe racks we have two more useful little articles illustrative of the possibilities of simple metal etching. Of course, a little woodwork is also necessary, but this is so simple as to require but little time. Oak is probably the most appropriate wood, except where the surrounding woodwork would fail to harmonize.

Tie Racks—The upper rack necessitates a piece of wood measuring $4\frac{1}{2}$ by 14 in., the corners of which should be uniformly rounded, but with the edges sharp and square. A piece of metal rod—brass or copper, according to the metal to be used for the etched plate—should be procured and doubly bent at each end so as to fit into two holes bored into the lower edge of the board. Unless a long narrow tray is at hand in which to etch the plate, the arrangement illustrated in the case of the long pipe rack should be adopted. That is, use two smaller plates with a match holder in between. In either case, first draw out the design to be etched full size and then transfer it to the metal with the carbon transfer paper. The painting out of the not-to-be-etched portions—that is, the lighter portions in the illustrations—with the asphaltum paint should now commence, using a No. 2 or 3 size water-color brush. Allow the etching to proceed at a moderate rate, and if many bubbles arise, add water to the solution. Kerosene will facilitate the removal of the paint; after which wash with soap and

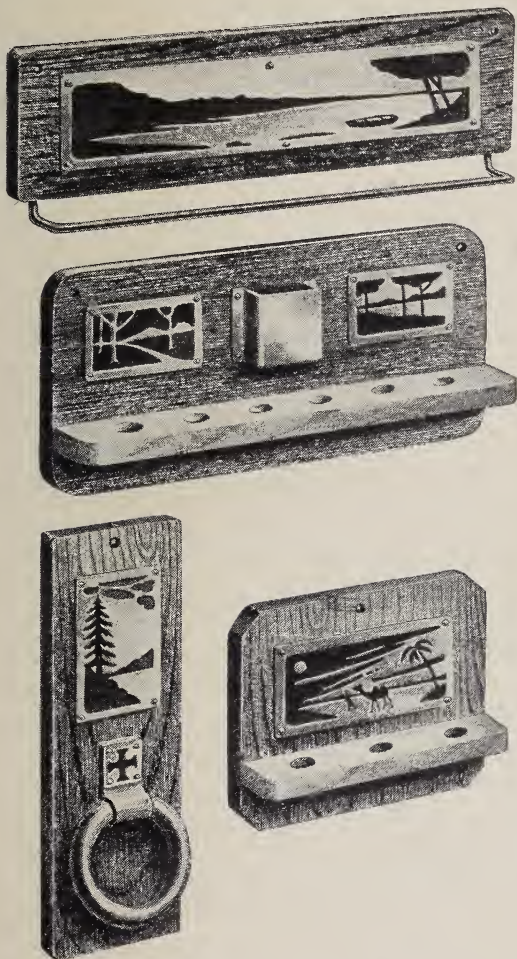


Fig. 16—Designs for Pipe and Tie Racks

good sharp edges and without splinters being torn off along the surface. When the two pieces have been trimmed to the proper shape and thoroughly sanded, they should be connected with glue and a few wire nails set in from behind. A coat of stain is then to be applied and followed by a vigorous rubbing with wax, unless a high finish is desired, in which case the usual varnish will be used. The dimensions and shape of the piece of metal for the match holder were previously given, and the etching of the plate will proceed as in the case of the tie rack above.



WHISK BROOM HOLDER

ANOTHER of the many attractive household articles that may be made at the cost of a few cents is the whisk-broom holder. In the design illustrated, the back board has beveled edges and bears a brass or copper plate etched with a simple design, under which is fastened a bent strip of the same metal to hold the broom. If desired, the metal plate may be replaced with a match holder or even a small mirror, in which case the etching will be confined to the strip that holds the whisk-broom.

A sufficient number of these household articles have been described and illustrated to put any amateur craftsman on the road to the artistic solution of many of the little problems in decoration and furnishing that come up from time to time. Any of the designs described for other articles may be used on



Fig. 18—Whisk Broom Holder

these holders by adapting them in size and form. Slight modifications or an original method of handling

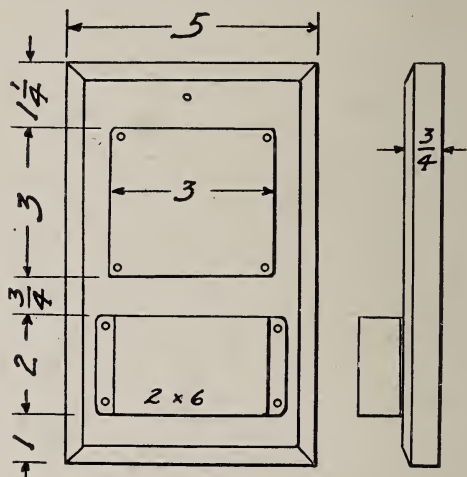


Fig. 19—Details of Whisk Broom Holder

the same subjects will give them a touch of individuality which is its own reward.



CANDLE SCONCE

ALTHOUGH the woodwork may seem to be the most conspicuous part of this candle sconce, it will, in reality, occupy but a small portion of our time. There are four pieces of wood; viz., the back, the shelf and two brackets, all of which may be readily prepared by anyone who can make fair use of the saw and plane. A little care will be necessary to have the four edges beveled off to exactly the same extent. Nail the shelf in place and then the brackets, setting in all nails from behind and supplementing them with a little glue. Stain as desired, and then thoroughly rub with wax.

A suitable little brass or copper pan to catch the drippings can usually be picked up at the stores; if not, one must be hammered up from a disk of the metal duly softened. Gradually work the edge over, turning the disk slightly between each stroke of the hammer. To hold the candle, we must prepare two strips about $\frac{3}{8}$ in. wide and 5 in. long, each of which is bent U-shape and riveted to the bottom of the metal drip pan. By this means we provide four upward-projecting pieces, which may be adjusted by bending so as to firmly hold the candle. The back plate or reflector should, of course, be of the same metal as the drip pan, and may be left plain or else have an elliptical strip etched around it as shown. This feature may be further varied by cutting the sheet in some other form than the rectangular. The etching in this

case will prove a very simple matter, and whichever of the previously described coloring or oxidizing solutions is employed, be sure to have at least the central portion of the reflecting plate rubbed up bright and evenly lacquered.

If it is desired to make an electric candle sconce,

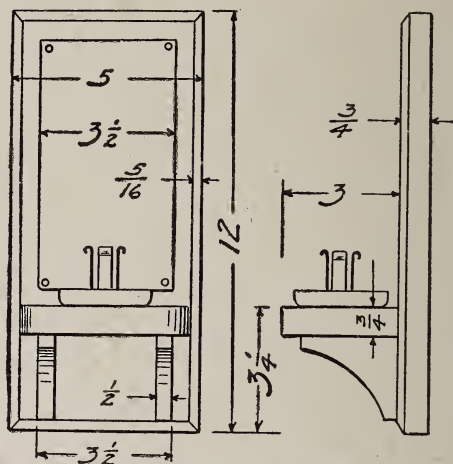


Fig. 21—Detail of Candle Sconce

the drip tray should be dispensed with and an ordinary electric socket set up in place. This should then be completely boxed in with thin pieces of wood, through which the operating key will project. The top of this small concealing box should not be less than $\frac{1}{4}$ in. thick, and project over the sides by a like amount. A central hole is also to be cut therein to allow the frosted electric candle to be screwed into the socket.

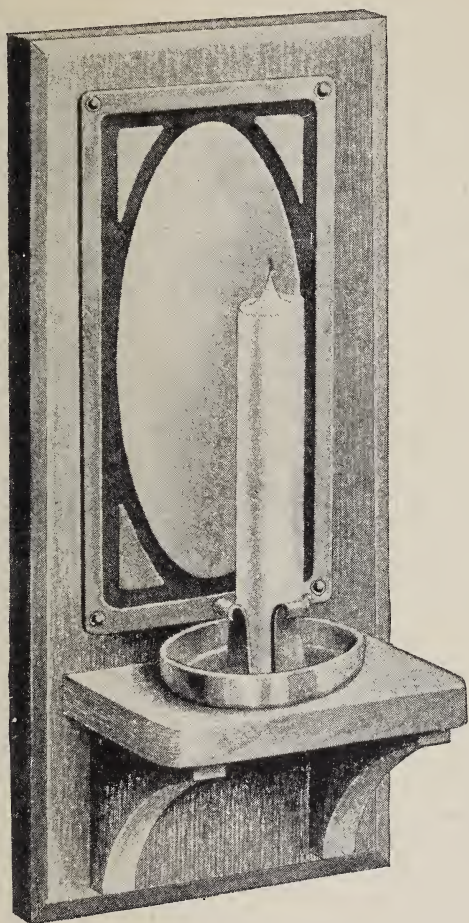


Fig. 20—A Candle Sconce

ARTS AND CRAFTS JEWELRY

FOR those who imagine that gold and diamonds are essential to the artistic, it would probably be difficult to explain just why arts-and-crafts jewelry is enjoying its present vogue. That is, why scarf pins, cuff buttons, watch fobs and the like, made from such a common and inexpensive metal as brass, unplated and with a seeming lack of workmanship, should be worn. Modern jewelry is a great creator of suspicion, so perfect is the cheap plated article in appearance; but the arts-and-crafts pieces are distinctive and make no pretense to qualities and values they do not possess. And it is this suggestion of honesty, we imagine, that makes them popular.

A few simple designs will be given in order to acquaint the reader with the general method and the various fittings that may be so reasonably purchased.

Watch Fobs—The watch fob is probably the simplest of the articles of jewelry. Not only is there an endless variety possible in the way of shape, but also in the etched design, which may be given quite an individual touch by adapting a college letter or initials, the insignia of a society or the monogram. Brass is the preferable metal and should not be thinner than No. 18 gauge. Cut to the proper shape with the tin snips or cold chisel, file the edges, and then thoroughly clean with emery cloth. As the design is small, be rather accurate in laying it out on the paper preparatory to transferring it to the metal. For the



Fig. 22—Designs for Watch Fobs

same reason the painting out of the edges and the raised portions will also have to proceed rather slowly and with some little care.

When the etching is sufficiently deep, remove the asphaltum paint with kerosene and then wash with soap and water. The slot for the strap or ribbon must

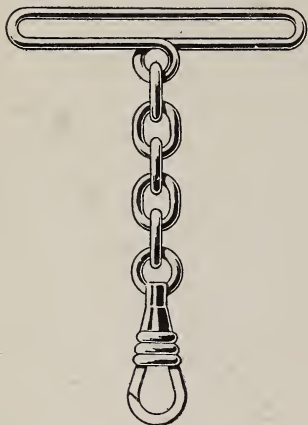


Fig. 23—Mounting for Watch Fob

now be cut by means of the small metal saw mentioned in connection with the desk calendar. A hole must be drilled in order to start the saw. To connect the fob and watch, a plain strip of leather having a longitudinal cut in each end to serve as loops may be used; or else the customary ribbon may be fitted up with the regular mounting illustrated, which costs 20 cents, gold filled. The verdigris effect is preferable as a finish, and if the design is appropriate,

the central portion should be raised by placing the fob face down on wood and beating it with the ball end of the hammer.



BROOCHES

BEFORE proceeding with the etching of brooches, we wish to draw the reader's attention to what may be had in the way of fittings, as illustrated in the accompanying sketch. The pin stem and two fastenings can be had in sizes running from 1½ to 3 in. and at prices ranging from two to five cents.

In the smaller brooches it will be almost impossible to accurately transfer the designs from the paper to the metal in the usual manner, in consequence of which it will generally be found best to select a piece of brass large enough for several pieces (composing, for instance, a uniform set of different sizes) and, after scouring the metal up bright with old emery cloth mark out the designs with a fine pencil point and then scratch them so that they will not be effaced when the piece is cleaned preparatory to painting. This latter operation will require a very fine brush, say, a No. 1 size with sable hair; and the asphaltum should be thinned with turpentine to the best working consistency. Paint the back also. Any slight irregularities may be removed by scraping when the paint is dry. When the etching is complete and the paint has been removed, the several pieces may be sawn apart and the edges trimmed off with the file, taking due care all the while not to mar the etching. Thoroughly clean the backs, place the pin-stem fastenings in place, apply the muriatic-acid soldering solution and some small specks of solder at the required points, and heat

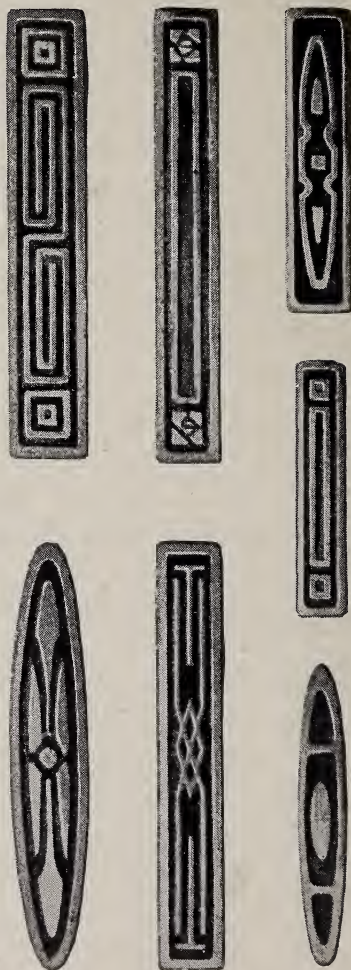


Fig. 24—Designs for Small Bar Pins or Brooches

over a gas flame until the solder flows freely all through the connections. Wash with soap and water, and then apply the verdigris solution, the formula for

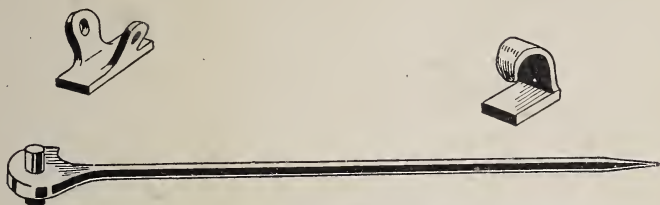


Fig. 25—Pin Stems and Fastenings for Brooches

which was previously given. After rubbing up the high lights, a coat of lacquer completes the brooch.



HATPINS

IN the matter of hatpins, the dealer in manual training supplies once more comes to our assistance, and for the price of two or three cents furnishes us with a nice long hatpin stem, pointed on one end and fitted with a large, flat, thin head on the other, as illustrated. When the head of the pin has been etched along the lines suggested by the accompanying design, it will then be soldered to the smaller head that is a part of the pin stem. If the two pieces are bright and clean, moisten with the soldering solution, place a very small piece of solder in place, and then hold over a gas flame until the solder flows freely.

As to size and shape of hatpin heads, there is no rule. The eight specimens illustrated will serve to set forth the general idea of arts-and-crafts hatpins, which may be made in brass or copper and finished in the oxidized or verdigris effects, the latter in connection with brass being preferable. As suggested in the case of watch fobs, the design may be given a personal turn by etching a monogram, college letter or initial.

Considerable care and accuracy must be exercised in marking out the design and in applying the protecting paint, on account of the smallness of the pieces. When the asphaltum has dried, the etching will be attended to as usual in the two-to-one nitric-acid solution. When etched to the proper depth, the paint will be removed, the piece made perfectly clean and bright, and then placed face down on wood and the central

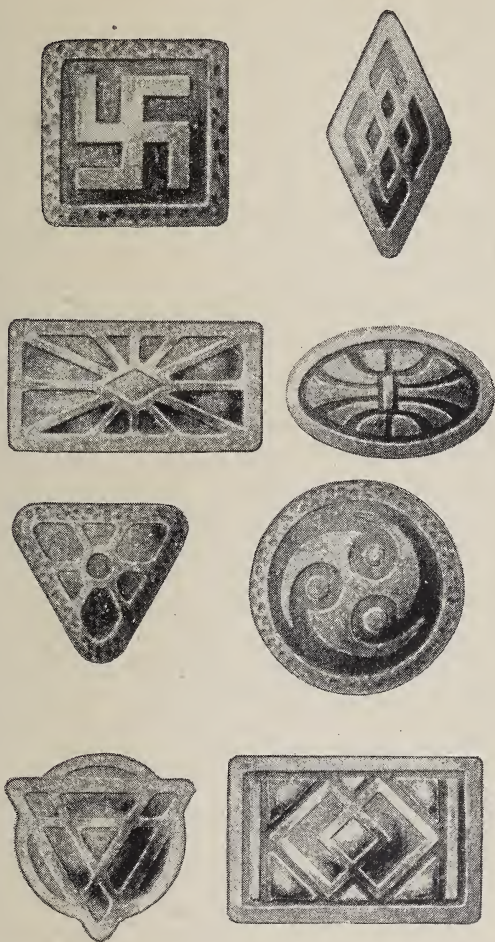


Fig. 26—Designs for Arts-Crafts Hatpins

portion beaten up with the ball end of the hammer. The extent of this operation will largely depend on the size of the piece and the nature of the design. The stem



Fig. 27—Stem for Hatpin

should now be soldered as above described, and the verdigris solution applied, after which the higher portions will be rubbed up bright and the protecting coat of lacquer applied.



TIE PINS AND CUFF BUTTONS

IN the making of scarf pins and cuff buttons we must once more call upon the supply house for such fittings as the pin stem or cuff button backs, the former costing two cents and the latter 20 cents, gold filled. The reason for dealing with these two entirely different articles together is that the same piece may generally be used for either. In fact, quite often the same design is worked out in triplicate to make the set. Brass is the preferable metal and should be finished in verdigris, using the solution previously described.

The designs in the illustration are the 12 signs of the zodiac and have a certain appropriateness when the sign corresponding to the month of birth is selected. The various shapes and outlines will serve as suggestions for tie pins and cuff buttons in general. Several pieces of this small stuff can usually be worked up together from a single piece of metal to advantage. The process of painting with the asphaltum, the etching, and the handling in general are all thereby simplified. When the etching is over and the paint removed, the several pieces may be cut apart, trimmed and filed smooth on the edges. Usually the design should be more or less raised in the center, which is accomplished by placing the piece face down on wood and beating with the ball end of the hammer. Before soldering, be sure that all surfaces to be united are thoroughly clean and bright. In this small work a 15-cent blowpipe will be found particularly convenient and can be easily

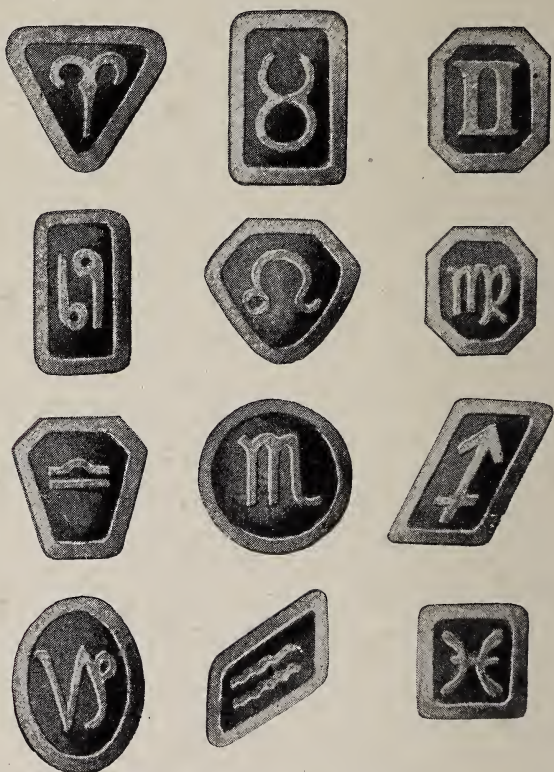


Fig.27A—Tie Pins and Cuff Buttons

mastered after a few trials. The coloring with the solution before mentioned will now be in order, after



Fig. 28--Pin Stems and Cuff-Button Backs

which the high lights will be brightened up and a coat of lacquer applied to render the effect permanent.



DESK CLOCKS

IT is the object of this article to show how any little clock such as may be bought in the department stores for a dollar or less may be developed into an attractive timepiece suitable for the desk or mantel. Even the ordinary dollar watch can be worked up to advantage.

The method is simply this: A sheet of brass or copper has about a third of its length bent over to form a base, and a circular opening large enough to reveal the clock face is cut in the upper portion. Upon the back of the sheet and around the opening, suitable pieces of metal must be soldered to hold the clock in place. The shape and number of these pieces will depend largely on the form of the clock and whether it has to be removed from the frame for winding. The dimensions of the sheet of metal will depend on the diameter of the clock face, which in the line drawings has been taken as 2 in. In case of a material change, the other measurements should, of course, be altered proportionally. Only two shapes of frames are illustrated, but almost any of the geometrical forms may form the basis of the outline. Sometimes the frame is made of less height and greater width, so as to accommodate a clock and calender side by side.

The metal should be not less than 16-gauge. Cut the sheet to the proper form and smooth off the edges with the file. Draw the circle for the central opening, and then cut it out with the small metal saw. After



Fig. 29—Design for Desk Clock

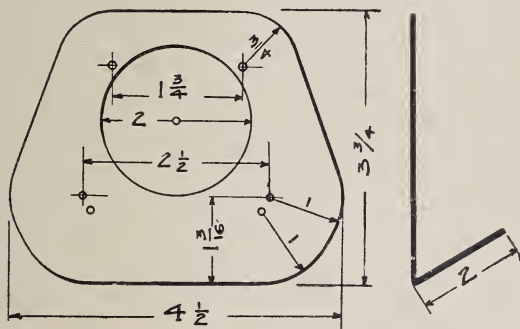


Fig. 30—Details of Small Desk Clock Mounting

smoothing the edge of the cut, bend the base back, using a wide vise with the metal placed between two pieces of wood, or else bend over the sharp edge of the table. The face should now be polished with a piece of fine, old emery cloth, and the design laid out preparatory to transferring it to the metal with the carbon paper. The asphaltum paint is now to be accurately applied to all the not-to-be-etched portions (including the back) and when dry, immerse in the

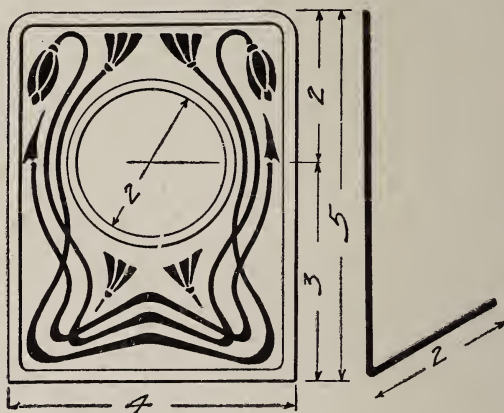


Fig. 32—Details of Second Style of Clock

two-to-one nitric-acid solution, using a flat photographer's tray. If the etching proceeds too violently, add water. After three or four hours of etching, remove the paint with kerosene and then wash with soap and water. The clips on the back for holding the clock in place are now to be soldered on, after which the oxidizing or verdigris solution is to be applied. After rubbing up the higher portions, flow on a uniform coat of lacquer—and our clock is complete.

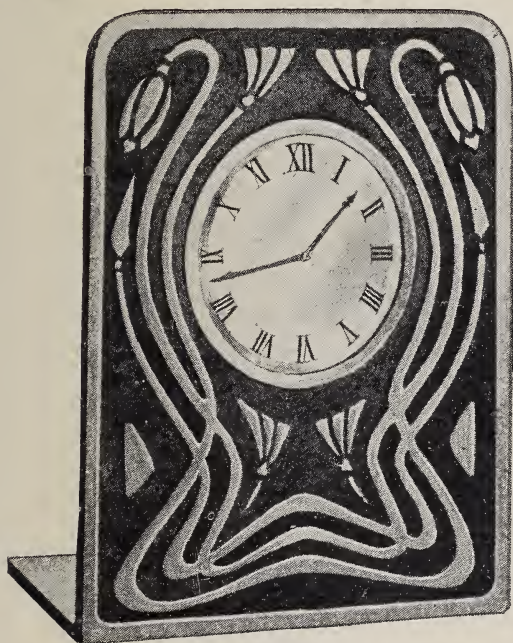


Fig. 31—Another Style of Desk Clock

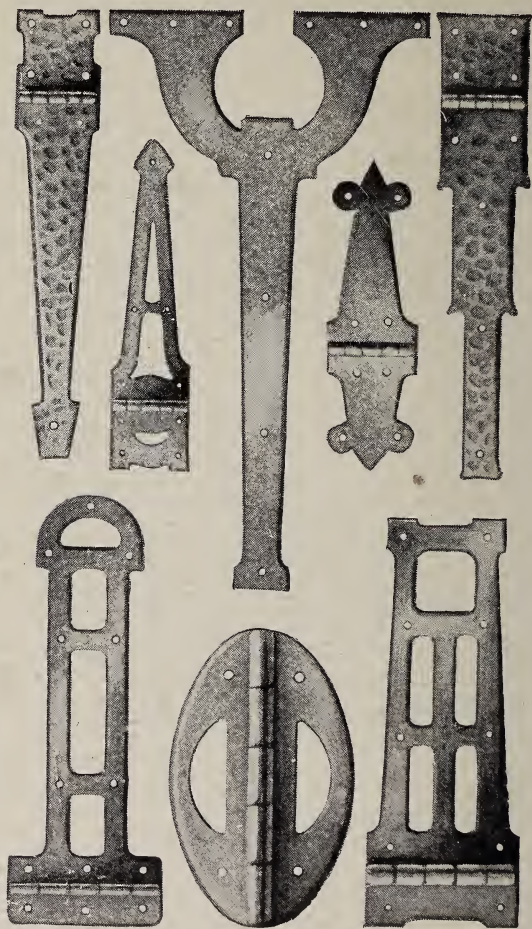


Fig. 33—Artistic Designs for Hinges

HINGES

THE making of arts-and-crafts furniture is now an important item in all manual training courses, and is probably one of the most popular of handicrafts among amateurs in general. This class of furniture demands a distinctive style of hardware. In fact, in the absence of the usual machine-made ornaments, the hardware is about the only added decorative feature.

Our plate of illustrations may serve to point out what may be done in the way of hinges—either real or imitation. The latter, used in connection with butt hinges, are merely plates of brass or copper appropriately shaped and attached with large-headed nails. In making the real hinge, we must first make an accurate full-size drawing, showing the pattern and the projecting lugs shown in the working drawing, Fig. 34. As a rule, three of these are integral with the stationary portion, and the remaining two form a part of the swinging half. With thin metal, say, 20-gauge, the piece may be cut out with the tin snips, but for the heavier gauges the metal saw must be used. Where portions are to be cut from the interior, a hole must first be drilled so that the saw blade can be inserted. A short piece of board, 3 in. wide, with a notch in the end, should be nailed or clamped to the bench, so as to overhang about 4 or 5 in. This will prove a great convenience when sawing, as it will firmly support the metal while the saw moves up and down through the slot. Place the saw in the frame so as to cut on the down stroke.

On the larger hinges and where the shape will permit, the edges should be bent over slightly with the hammer, so as to give the appearance of thickness. When the projecting lugs are all filed up square and properly fitted, the bending should be proceeded with.

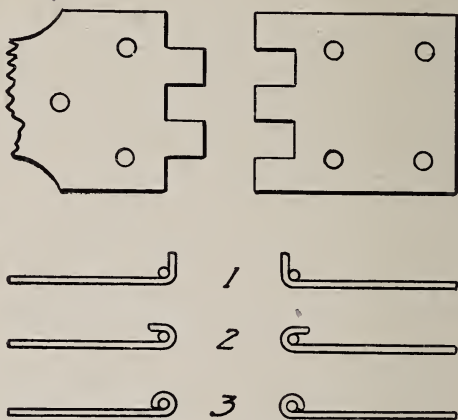


Fig. 34—Hinge Patterns and Stages of Construction

The various stages are indicated in Fig. 34 and after stage two has been reached, a straight wire nail should be inserted and the piece hammered closely around it. Some further filing will now be necessary in order to get the two sides to fit properly together. This accomplished, however, nothing more remains than to fit in the pin and trim off its ends, which are then to be slightly burred to prevent it from falling out. The wire nail used in forming the lugs will serve as a pin, provided the head is cut off and it is perfectly straight.

The etching process is rarely applied to hinges, but

the several coloring solutions, heretofore described, are to be applied according to the effect desired. Plain lemon brass and hammered copper are popular finishes. Lacquer is used in all cases.



DRAWER PULLS

THERE is probably no article within the scope of home metal work, in the making of which the efforts of the amateur show up to better advantage than in the case of arts-and-crafts drawer pulls. From our illustration of nine specimens the reader will get some idea of the variety obtainable; and, when it is realized that both brass and copper are available, and these in various finishes, the artistic possibilities will be evident. A piece of mission furniture, if but of pleasing design, though made by a school-boy and from pine lumber, will, when properly stained and fitted with this hand-made hardware, present an attractive appearance.

The gauge of the metal will run about No. 16 for average sizes. When it is desired to keep the piece perfectly flat, do all the cutting with the metal saw. Interior openings require the drilling of a hole for the insertion of the saw blade, the end of which is then re-connected to its frame. The handles are of brass or



Cross Sections

Fig. 36—Drawer-Pull Construction

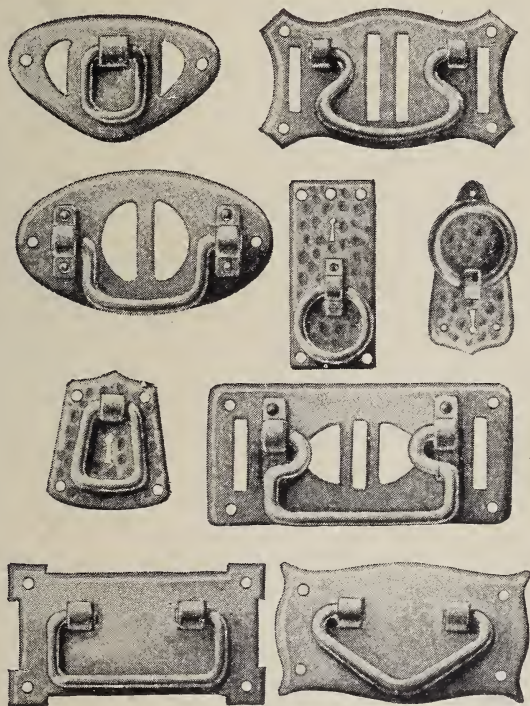


Fig. 35—Designs for Drawer Pulls

copper rod, bent over wood and with a wooden mallet, so as to avoid marring them. These are connected to the plate by three methods, which are clearly indicated in the sectional view. In the first method, the metal strip is first snugly bent around the handle and then the two ends are inserted into the small rectangular opening in the plate, where the ends are bent over and hammered flat. In the second method, a plain riveted strap is used. In the third, the strap is closely fitted around the handle and the two ends spread apart and drilled for the rivets. Where the size and pattern will permit, the edges of the plate are to be beveled over with the hammer or mallet so as to give the plate the appearance of having considerable thickness. If the pulls are to be used in connection with the hinges previously described, the finish and metal should, of course, be the same.



Additional
Subjects
by
Other
Authors

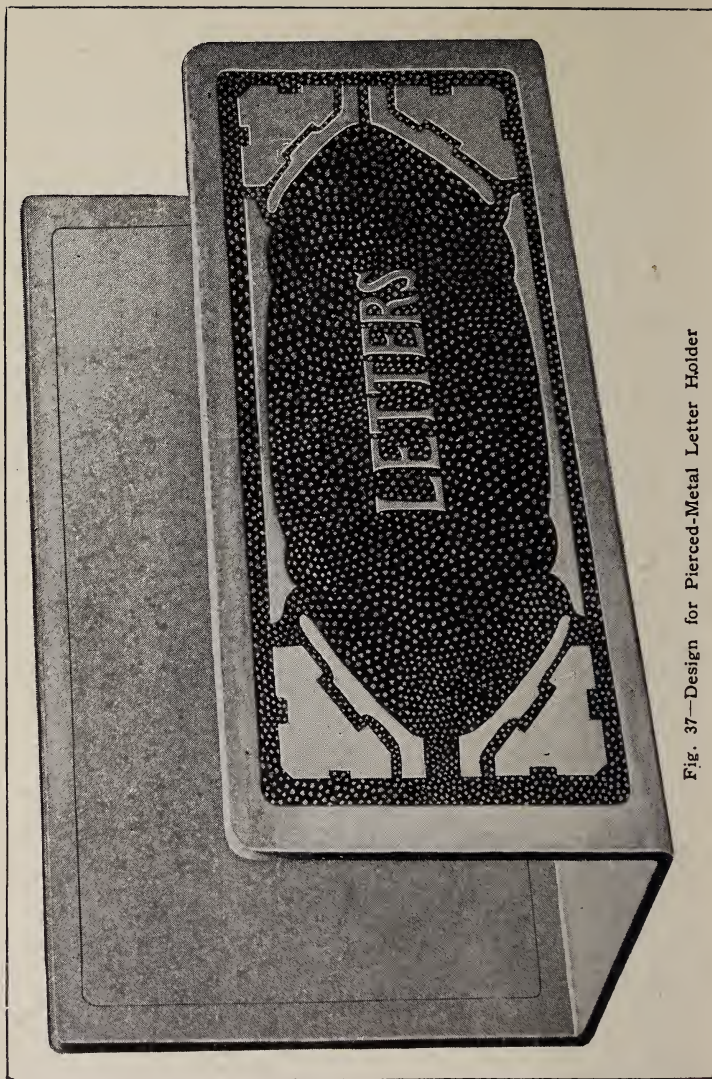


Fig. 37—Design for Pierced-Metal Letter Holder

A LETTER HOLDER OF PIERCED METAL

THE letter holder shown in the illustration will be found convenient for holding out-going letters that await the postman's coming. It can be made of either copper or brass and need not be of very heavy material. Gauge 22 will be about the right weight.

One sheet of metal 6 by $9\frac{1}{2}$ in. will be needed; also, a board on which to work it, and an awl and hammer.

Prepare a design for the front. If one such as is shown in Fig. 37 is to be used, make one-quarter of it, then get the other parts by folding on the center lines and tracing. This will insure having all parts alike. The letters can be put on afterward.

Fasten the metal to the board, using tacks, and nailing outside of the required space, in the waste metal. Trace the design on the metal with carbon paper; or, if desired, paste the paper design right on the metal. Pierce the metal between the marginal line and the design, as shown, with an awl. The holes should be uniform along the outlines but should be pierced promiscuously otherwise. On the back, only the marginal line is to be pierced.

Remove the metal, and the paper, if it was pasted to the metal, and trim off the surplus metal where the tacks were placed. File off any sharpness so that the hand may not be injured in handling it. Place the metal on the edge of a table or between two boards, and bend on the two lines indicated in Fig. 38, to right angles.

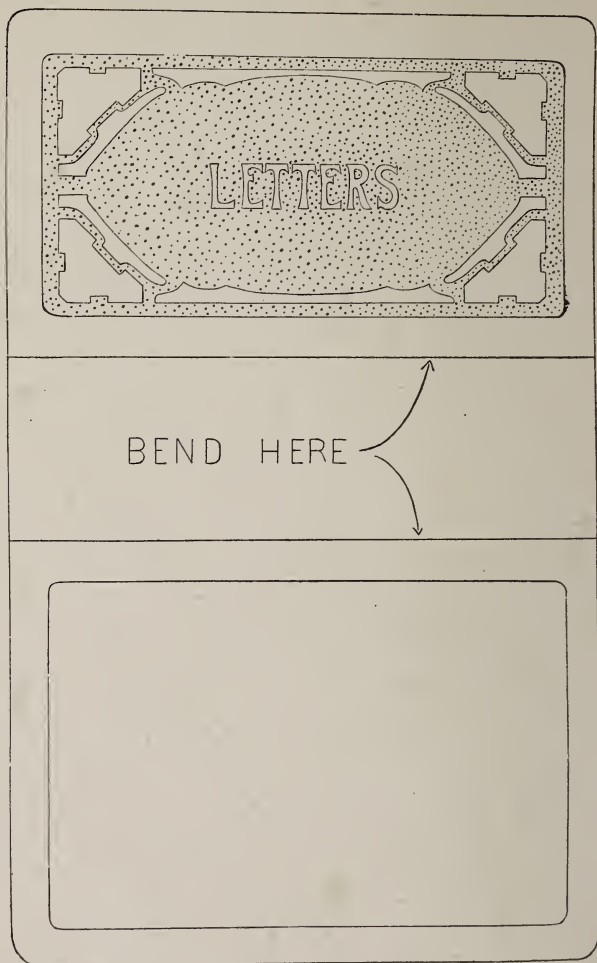


Fig. 38—Details of Letter Holder

A good finish is obtained by just letting the copper age with its natural color. If any polishing is to be done, it must be done before the metal is fastened to the board and pierced.



HOW TO MAKE A WATCH FOB

THE fixtures for the watch fob shown—full size—may be made of either brass, copper or silver. Silver is the most desirable but, of course, the most expensive.

The buckle may be purchased. The connection is to be of leather of a color to harmonize with that of the fixtures. The body of the fob may be of leather of suitable color or of silk. Of the leathers, greens and browns are the most popular, though almost any color may be obtained.



Fig. 39

Make full-size drawings of the outline and design of the fixtures. With carbon paper trace these on the metal. Pierce the metal of the parts that are to be removed with a small hand drill to make a place for the leather or silk. With a small metal saw, cut out these parts and smooth up the edges, rounding them slightly so they will not cut the leather or silk. Next cut out the outlines with the metal shears.

File these edges, rounding and smoothing with emery paper. The best way of handling the decorative design is to etch it and, if copper or brass, treat it with color.

For etching, first cover the metal with black asphaltum paint, on the back and all parts that are not to be touched with the acid. In the design shown, the unshaded parts should not be etched and should, therefore, be covered the same as the back. Apply two coats, allowing each time to dry, after which immerse the metal in a solution prepared as follows: 3 parts water, 1 part nitric acid, 1 part sulphuric acid. Allow the metal to remain in this until the acid has eaten to a depth of $\frac{1}{32}$ in., then remove it and clean in a turpentine bath, using a swab and an old stiff brush. The amount of time required to do the etching will depend upon the strength of the liquid, as well as the depth of etching desired.

For coloring silver, as well as brass and copper, cover the metal with a solution of the following: $\frac{1}{2}$ pt. of water in which dissolve, after breaking up, five cents' worth of sulphurated potassium. Put a teaspoonful of this into a tin with 2 qt. of water. Polish a piece of scrap metal and dip it in the solution. If it colors the metal red, it has the correct strength. Drying will cause this to change to purple. Rub off the high lights, leaving them the natural color of the metal and apply a coat of banana oil lacquer.



A BRASS BOOKMARK

SECURE a piece of brass of No. 20 gauge, having a width of $2\frac{1}{4}$ in. and a length of 5 in. Make a design similar to that shown, the head of which is 2 in.

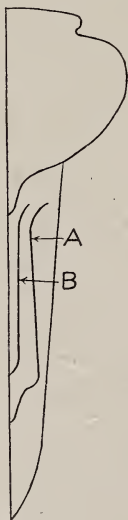


Fig. 40

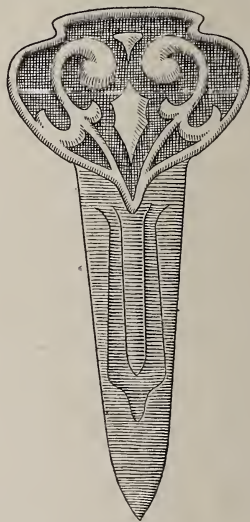


Fig. 41

Designing the Bookmark

wide, the shaft 1 in. wide below the head and the extreme length, $4\frac{1}{2}$ in. Make one-half of the design, as shown in Fig. 40, freehand, then trace the other half in the usual way, after folding along the center

line. Trace the design on the metal, using carbon paper, which gives the outline of the design Fig. 41.

With the metal shears, cut out the outline as indicated by the drawing. With files, smooth off any roughness and form the edge so that it shall be nicely rounded.

The parts of the design in heavy color may be treated in several ways. A very satisfactory treatment is obtained by etching, then coloring. Clean the metal thoroughly with pumice stone and water, or with alco-

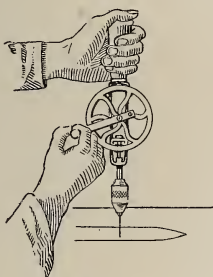


Fig. 42

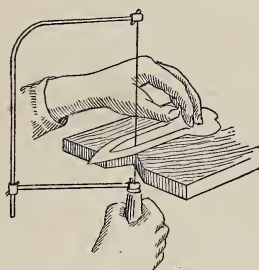


Fig. 43

Sawing the Metal

hol, before the design is applied. Cover all the metal that is not to be lowered with a thick coating of asphaltum. Allow this to dry, then put on a second coat. After this has dried thoroughly immerse the metal in a solution composed as follows: 3 parts water, 1 part sulphuric acid, 1 part nitric acid.

Allow the metal to remain in this solution until the exposed part has been eaten about $\frac{1}{32}$ in. deep, then remove it and clean off the asphaltum, using turpentine. Do not put the hands in these solutions, but use a swab on a stick.

For coloring olive green use 2 parts water to 1 part permuriate of iron. Apply with a small brush.

The lines at A and B will need to be cut, using a small metal saw. Pierce a hole with a small drill, Fig. 42, large enough to receive the saw and cut along the lines as in Fig. 43. A piece of wood with a V-shaped notch which is fastened firmly to the bench, forms the best place in which to do such sawing. The teeth of the saw should be so placed that the sawing will be done on the downward stroke. The metal must be held firmly and the saw allowed time to make its cut, being held perpendicular to the work.

After sawing, smooth the edges of the metal with a small file and emery paper. The metal clip may be bent outward to do this part of the work.



MAKING PHOTO SILHOUETTE BRASS PLAQUES

SECURE a brass plate, having a smooth surface the right size for the photograph, and cover it with a coat of paraffin. This is done by heating the paraffin in a vessel hot enough to make the wax run freely, then pouring the liquid over the entire surface of the brass.

When the paraffin has cooled sufficiently, the outlines of the photograph must be drawn upon its surface. There are three ways of doing this: First, the photograph can be traced on tissue paper and then re-traced on the paraffin surface. The exact outline of the photograph can be obtained this way without destroying the print. Second, if you have several copies of the photograph, one can be utilized by tracing direct to the surface of the paraffin. In using either of the two methods described, carbon paper must be placed on the paraffin before the tissue paper or photograph is laid upon it. Third, cut out the outlines of the photograph and lay it on the paraffin surface, then trace around the edges with the point of a needle or sharp point of a knife. The outlines drawn by the first method are cut through the paraffin in the same way. The paraffin is carefully removed from the inside of the lines, leaving the brass surface perfectly clean, as is shown in Fig. 44.

The exposed part of the plate is now ready to be etched or eaten away to the right depth with acid. The acid solution is made up of $1\frac{1}{2}$ parts muriatic

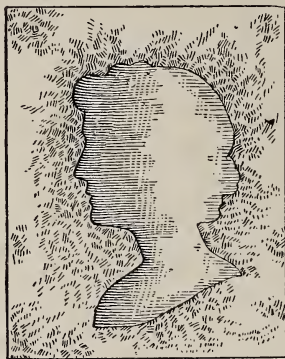


Fig. 44—Waxed Brass Plate



Fig. 45—Finished Plaque

acid and 2 parts water. The mixture should be placed in a glass or earthenware vessel. If the plate is a small one, a saucer will do for the acid solution. Pour the acid on the plate where the paraffin has been removed and allow it time to etch. The plate should be removed every five minutes to examine the etching. If any places show up where the paraffin has not been entirely removed, they must be cleaned so the acid will eat out the metal. When the acid solution becomes weak, new solution must be added until the proper depth is secured. Rinse the plate in cold water, stand in a tray and heat it sufficiently to run off all the paraffin. Polish the plate by rubbing it with a piece of flannel.

The plaque can be given a real antique finish by painting the etched part with a dull black paint. Drill a small hole in each of the four corners, being careful not to dent the metal. The plaque is backed with a piece of wood, $\frac{3}{4}$ in. thick, the dimensions of which should exceed those of the brass plate sufficiently to harmonize with the size of the plaque. The wood should be painted black with the same paint used in the plaque. Paint the heads of four thumb tacks black and use them in fastening the plaque to the board. The finished silhouette will appear as shown in Fig. 45.



BRASS FRAME IN REPOUSSE

REPOUSSE is the forming of raised designs on metal by hammers and punches, the design being worked up from the reverse side. There is nothing especially hard in working up the design of the frame shown.

Punches can be purchased, as can the pitch bed or block. Both can be made easily, however. There will need to be several punches of different sizes and shapes. A piece of mild steel about $\frac{3}{8}$ in. square can be easily worked into tools shaped as desired. A cold chisel will be needed to cut the metal to length, a file to reduce the ends to shape, and a piece of emery paper to smooth and polish the end of the tool so that it will not scar the metal.

A small metal box must be secured to hold the pitch. The illustration shows an iron receptacle. The pitch is prepared by heating the following materials in these proportions: pitch, 5 lb.; plaster of Paris, 5 lb.; tallow, $\frac{1}{2}$ lb. To put it in another way, use pitch and plaster in equal parts with $\frac{1}{10}$ part tallow. See that the pitch and plaster are dry so that the moisture will not cause the pitch to boil over. Keep stirring the mass so that it never boils. Melt the pitch first and add the plaster by degrees.

For a piece of repousse such as the frame shown, secure a piece of brass about No. 18 gauge. With carbon paper trace the design on the brass. Place the metal on the pitch bed and work over the outline of

the design. Use the chisel-edged tool and try to make the lines continuous. When this has been done, heat the pitch slightly and place the metal, design down, on the pitch, and with the raising punches work up the shape as desired after the pitch has hardened. When the desired form has been obtained, turn the metal over and "touch up" any places improperly

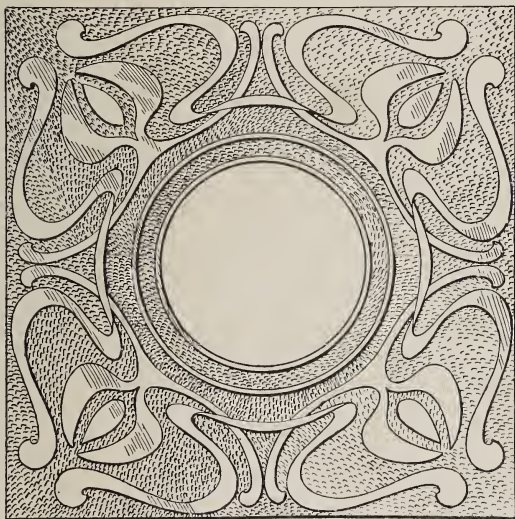


Fig. 46—Design for the Frame

raised. The metal will probably be warped somewhat. To remedy this, place a board on the metal and pound until the metal assumes a flat shape again. Next drill a hole in the center waste and saw out for the opening, using a small metal saw. Trim up the edges and file them smooth.

Clean the metal thoroughly, using powdered pumice with lye. Cotton batting fastened to the end of a

stick will make a good brush. Upon the cleansed metal put a lacquer to prevent tarnishing. Metal clips

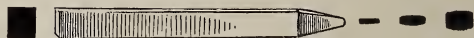


Fig. 47—Working Out the Design

may be soldered to the back to hold the picture in place and also a metal strip to hold the frame upright. These should be placed before the metal is lacquered.



HOW TO MAKE A CANDLESTICK

A CANDLESTICK of very simple construction and design can be made as follows: Secure a piece of brass or copper of No. 23 gauge, of a size sufficient to make the pieces detailed in Fig. 49. A riveting hammer and a pair of pliers will be needed, also a pair of tin shears and a piece of metal upon which to rivet.

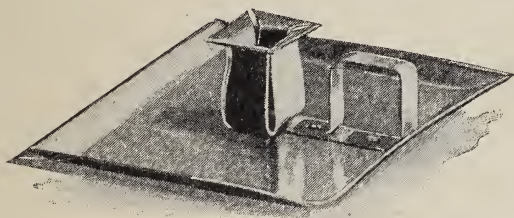


Fig. 48—Candle Holder Complete

Cut out a piece of metal for the base to a size of $5\frac{1}{2}$ by $5\frac{1}{2}$ in. Trim the sharp corners off slightly. Draw a pencil line all around the margin and $\frac{5}{8}$ in. away from the edge. With the pliers, shape the sides as shown in the illustration.

Next lay out the holding cup according to the plan of development shown, and cut out the shape with the shears. Polish both of these pieces, using any of the common metal polishes. Rivet the cup to the base, and then, with the pliers, shape the sides as shown

in Fig. 48. The manner of making and fastening the handle is clearly illustrated. Use a file to smooth all the cut edges so that they will not injure the hands.

In riveting, care should be taken to round up the heads of the rivets nicely, as a good mechanic would.

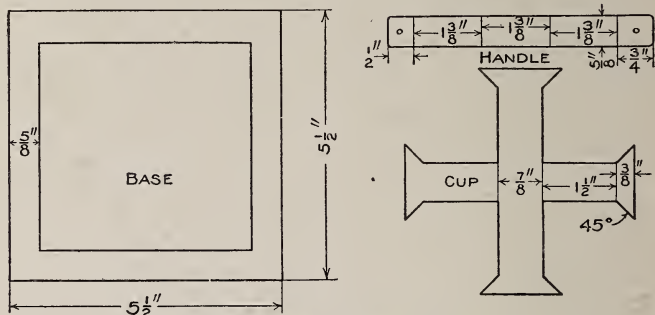


Fig. 49—Details of Candle Holder

Do not be content merely to bend them over. This rounding is easily accomplished by striking around the rivets' outer circumference, keeping the center high.

A good lacquer should be applied after the parts have been properly cleaned and polished, to keep the metal from tarnishing.



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